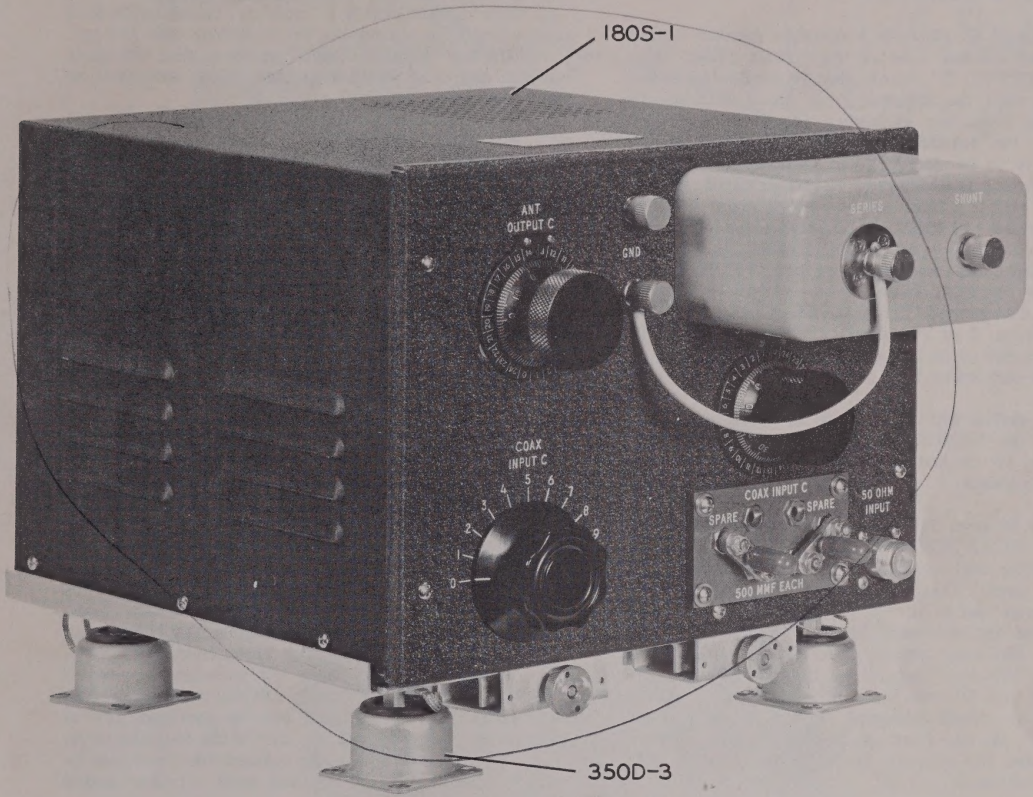
INSTRUCTIONS FOR

180S-1 ANTENNA TUNER

520-5542-00
2nd Edition
1 February 1962



C176-01-P

Figure 1. 180S-1 Antenna Tuner and 350D-3 Shockmount

1.1 GENERAL DESCRIPTION.

The 180S-1 Antenna Tuner, figure 1, is basically a 1-kw pi network for matching various antenna impedances to a 50-ohm coaxial transmission line in the range of 3 to 30 mc.

It is used as an L-network in most cases, but when the L-network cannot match the desired antenna, the complete pi circuit is used.

2.1 INSTALLATION.

Keep the antenna lead-in inside the building as short as possible. If the tuner is used inside an aircraft, the lead-in inside the aircraft should be as short as 12 inches, if at all possible. This lead length influences the selection of a mounting position for the tuner.

With a heavy conductor such as shield braid, attach the GROUND terminal of the tuner to a good ground.

©COLLINS RADIO COMPANY
Second Printing November 1966

COLLINS

Cedar Rapids, Iowa, U.S.A.

Ground radials buried below the surface of the ground may be necessary. If the installation is in an aircraft, attach the ground wire to the skin of the aircraft.

3.1 CIRCUIT DESCRIPTION.

Refer to figure 6. There is a variable vacuum capacitor on the antenna side of the circuit called "ANTENNA OUTPUT C" which may be connected either in series with the antenna or in shunt with it. To connect the capacitor in series, the antenna is connected to the terminal marked "SERIES." If the capacitor is to be connected in shunt with the antenna, the antenna is connected to the terminal marked "SHUNT," and a jumper is connected from the terminal marked "SERIES" to ground. To leave this capacitor completely out of the circuit, the antenna is connected to the terminal marked "SHUNT," and no jumper is used between the terminal marked "SERIES" and ground. This capacitor has a range of capacity from 4 to 500 mmf and may be connected either in series or shunt or not used at all, as necessary in the particular case.

Always in series with the antenna is a 15-uh variable coil called the "SERIES COIL." This coil is variable from 0 to 15 uh and is adjusted as needed for any particular antenna.

Across the 50-ohm input circuit are three capacitors called the "COAX INPUT C." One of these capacitors is a variable air capacitor which is variable from 50 to 570 mmf. This capacitor is always connected in the circuit and is always in shunt with the 50-ohm line. There are two more 500-mmf capacitors made up of five 100-mmf capacitors connected in parallel. These two 500-mmf capacitors may be connected in shunt with the 50-ohm line, if needed, by properly inserting the small jumpers in the jacks marked "500 mmf" on the front of the tuner. Spare jacks are provided for storage of the jumpers when they are not being used.

4.1 TUNING PROCEDURE.

a. Connect KWM-2 Transceiver, 302C-3 Directional Wattmeter, and 180S-1 Antenna Tuner as shown in figure 2. If a transmitter other than that of the KWM-2 is used, connect in the same fashion, but be sure a directional wattmeter (or swr meter) having adequate power handling capacity is used. Leave the coaxial lead disconnected from the 180S-1 at this time.

b. Connect a dummy load to the coaxial lead from the directional coupler. Use any 52-ohm load capable of dissipating the power output expected from the transmitter.

c. Tune and load the KWM-2 (or other transmitter) according to its instruction book.

d. Remove the dummy load from the circuit, and connect the coaxial lead to the 180S-1 Antenna Tuner in place of the load.

e. Put "COAX INPUT C" jumpers in "SPARE" jacks. Set "COAX INPUT C" dial to zero. Connect wire antenna to terminal marked "SHUNT." Connect ground strap from terminal marked "SERIES" to ground terminal. Set "ANT OUTPUT C" control to 24-00. Set "SERIES COIL" to zero.

f. Switch the wattmeter to "200 WATTS REFLECTED" position (or use swr meter).

g. Switch KWM-2 to "LOCK KEY" condition.

h. With "COAX INPUT C" control, maintain KWM-2 plate current at maximum, but no higher than 210 ma.

i. With the "SERIES COIL" control, find the plate current dip, and watch reflected power indication at the same time.

j. When properly tuned, the "COAX INPUT C" control will maintain loading and should be set for plate current between 200 and 230 ma. The "SERIES COIL" control maintains antenna resonance and should be used to dip the plate current and the reflected power indications to minimum.

k. If the "COAX INPUT C" control reaches maximum (dial reads 10), add in one of the 500-mmf capacitors, using one of the "COAX INPUT C" jumpers.

l. If a unity swr still cannot be obtained, connect the antenna to the terminal marked "SERIES," and repeat steps h, i, and k at the same time adjusting "ANTENNA OUTPUT C" along with the controls in steps h and i. (Maximum C is obtained when the dial reads 0.)

m. If it is still impossible to obtain a unity swr, connect the antenna to the terminal marked "SHUNT," and connect a jumper from the terminal marked "SERIES" to ground. Then repeat steps h, i, and k at the same time adjusting "ANTENNA OUTPUT C" along with the controls in steps h and i.

n. If a unity swr cannot be obtained with any of the above combinations, the antenna impedance is probably beyond the range of the antenna tuner. However, the tuner should handle almost any reasonable antenna with the exception of very short antennas at low frequencies (less than 1/8 wavelength below 7 mc). In the case where unity swr cannot be obtained, use the minimum swr that can be obtained, if it is reasonable (less than 2.5 to 1). If the swr cannot be made less than 2.5 to 1, the antenna length should be either increased or decreased until a better match can be made.

o. It should be noted that on the higher frequencies (20 to 30 mc), the setting of the various controls becomes quite critical. When tuning adjustments are made, the controls should be adjusted very slowly in order that the proper setting will not be passed over too quickly to be noticed.

p. As the transmitter frequency is moved about in normal operating procedures, watch the swr, and if it becomes excessive, begin the tuning procedures again.

q. A combination of "ANT OUTPUT C" and "SERIES COIL" control settings may optimize the minimum reflected power indication. A number of combinations of settings of the above controls may produce resonance. In general, the highest dial setting for "ANT OUTPUT C" producing resonance will produce the best results.

r. Make a log of the settings for each frequency. If there are no changes in the antenna system, it should be possible to return to a given frequency by setting up the dial numbers without having to go through the entire tuning procedures.

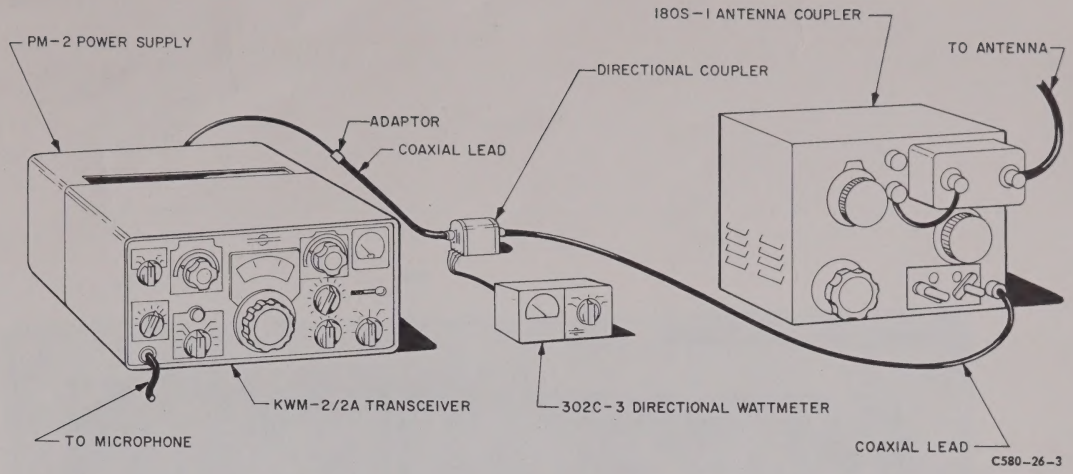


Figure 2. 180S-1 and KWM-2/2A Hookup Diagram

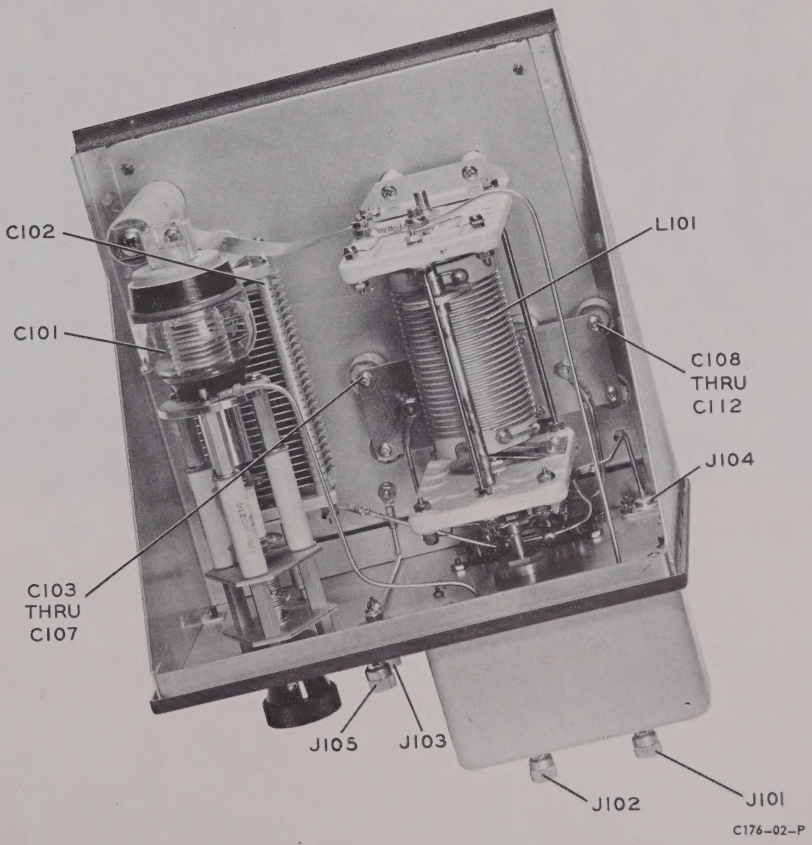


Figure 3. 180S-1 Top Open View

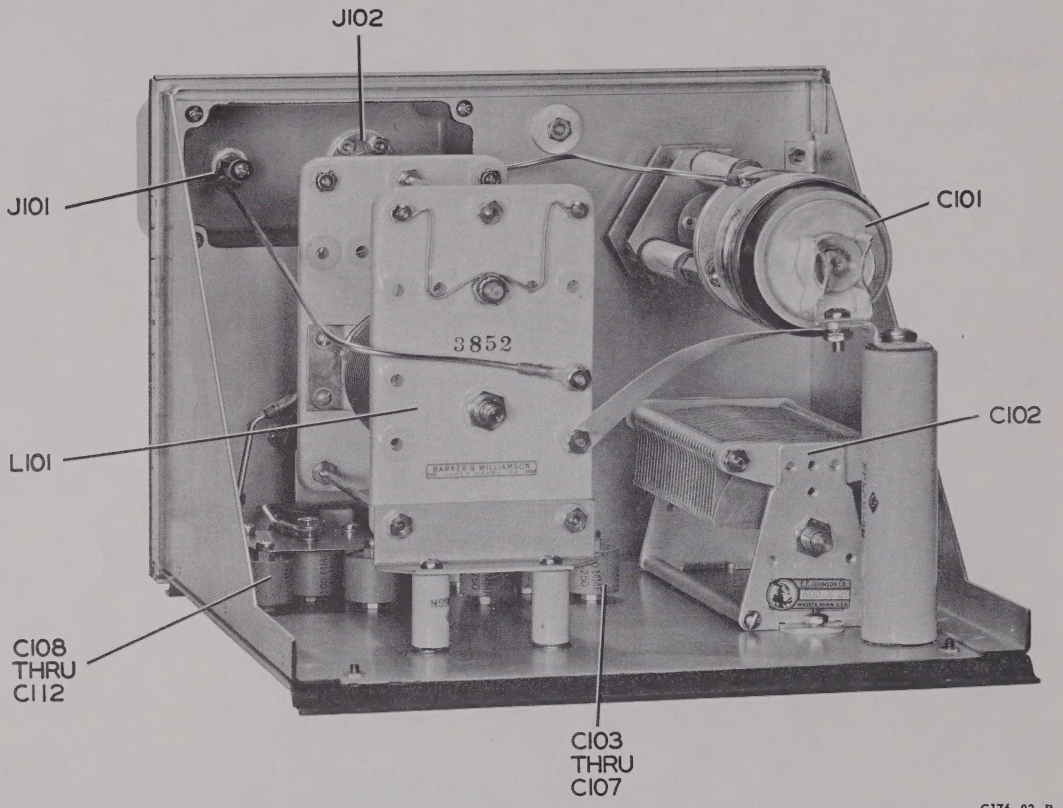


Figure 4. 180S-1 Rear-Open View

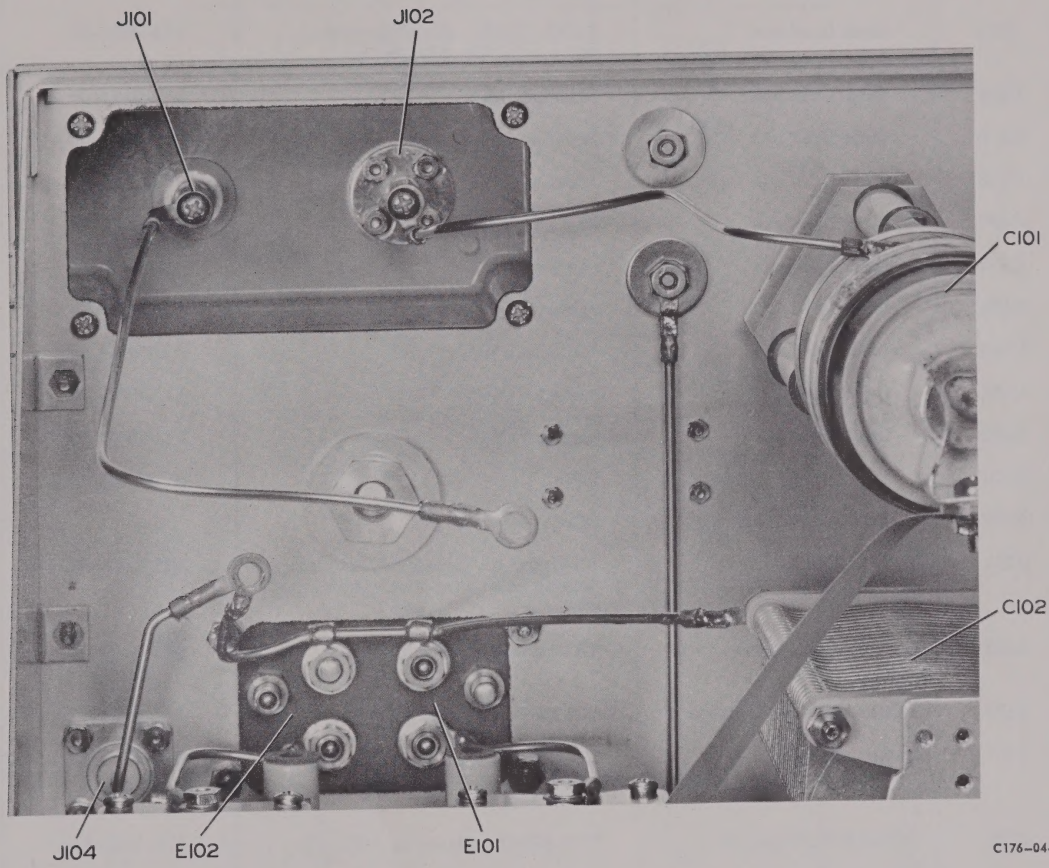


Figure 5. 180S-1 Rear Open, Inductor Removed

5.1 PARTS LIST.

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
C101	Antenna Output Capacitor	CAPACITOR : Vacuum - Jennings UCSL 4-500	919-0158-00
C102	Coaxial Input Variable Capacitor	CAPACITOR: Variable; 570 mmf max, 25.2 mmf min. 0.045 inch spacing	920-0065-00
C103	Input fixed pad	CAPACITOR: Fixed Ceramic; 100 mmf ±10%; 5000 WV	913-0821-00
C104	Input fixed pad	Same as C103	913-0821-00
C105	Input fixed pad	Same as C103	913-0821-00
C106	Input fixed pad	Same as C103	913-0821-00
C107	Input fixed pad	Same as C103	913-0821-00
C108	Input fixed pad	Same as C103	913-0821-00
C109	Input fixed pad	Same as C103	913-0821-00
C110	Input fixed pad	Same as C103	913-0821-00
C111	Input fixed pad	Same as C103	913-0821-00
C112	Input fixed pad	Same as C103	913-0821-00
E101	Pad Selector Jumper	LINK:	542-3263-002
E102	Pad Selector Jumper	LINK:	
J101	SHUNT Antenna Connection	TERMINAL: Brass, nickel plate binding post, wire slot with clamp shoe	372-1540-00
J102	SERIES Antenna Connection	TERMINAL: Same as J101	372-1540-00
J103	GROUND Connection	TERMINAL: Same as J101	372-1540-00
J104	Coaxial Input Connection	RECEPTACLE: Coaxial, Type N female contact, Military UG-58A/U	357-9003-00
J105	GROUND Connection	TERMINAL: Same as J101	372-1540-00
L101	Series Inductor	INDUCTOR: Variable, 15 uh total	980-0111-00
P101		PLUG: Coaxial, Type N male contact for RG-8/U cable or equivalent, Military UG-21B/U	357-9040-00

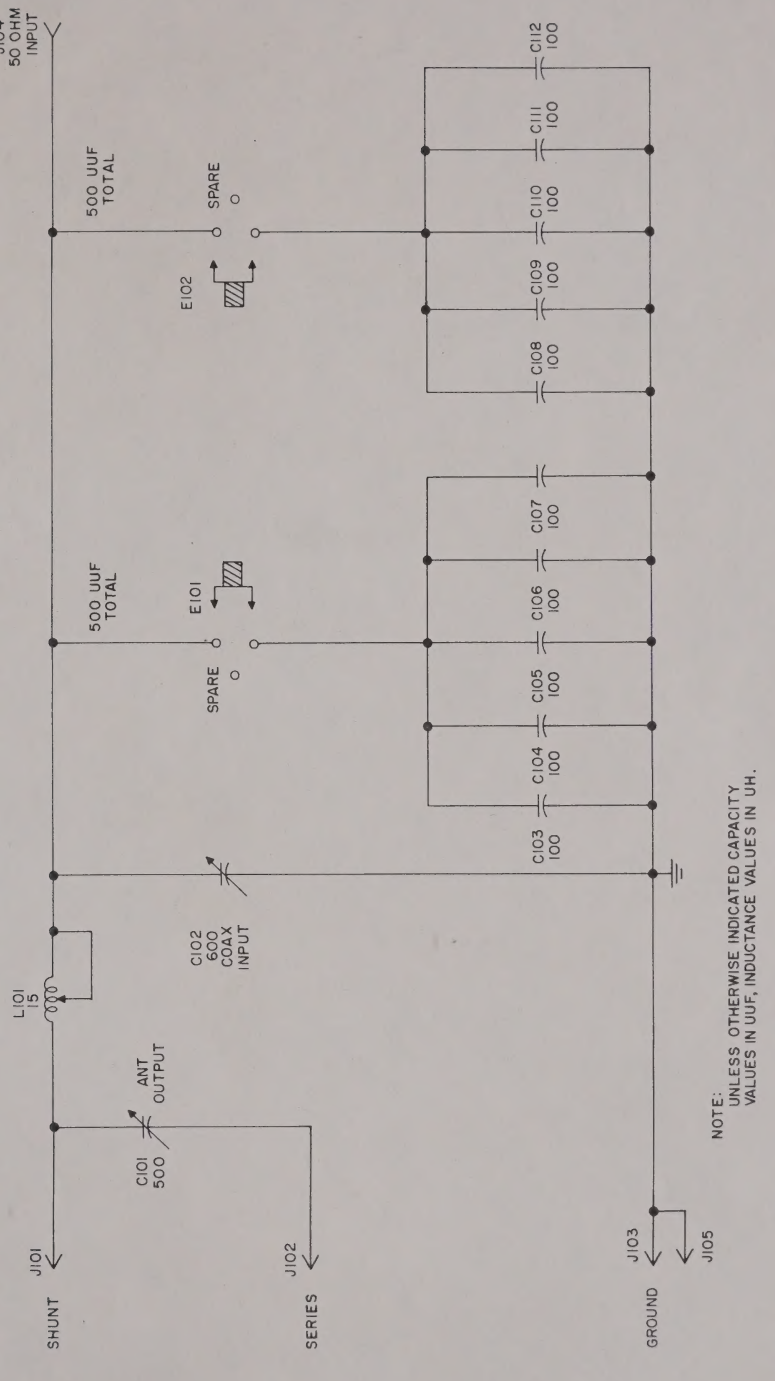


Figure 6. 180S-1 Antenna Tuner, Complete Schematic